2006 NASA Project Management Challenge Conference

Can “Troubled Projects” Be Prevented?

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Can a Troubled Project Be Prevented?

Or, What can you do to avoid trouble on your Project

Steps can be taken from the start to make sure a Project doesn't get into trouble

Observing telltale signs that a Project might be heading down the "Trouble Path" can prevent getting into trouble

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Agenda

- Definition of Success and Trouble for Projects and Contributing Elements
- Specific Characteristics of Two Projects Used for Case Study
- Comparison of a Successful Approach and Remedial Actions Leading to Success
- How Trouble Could Have Been Prevented

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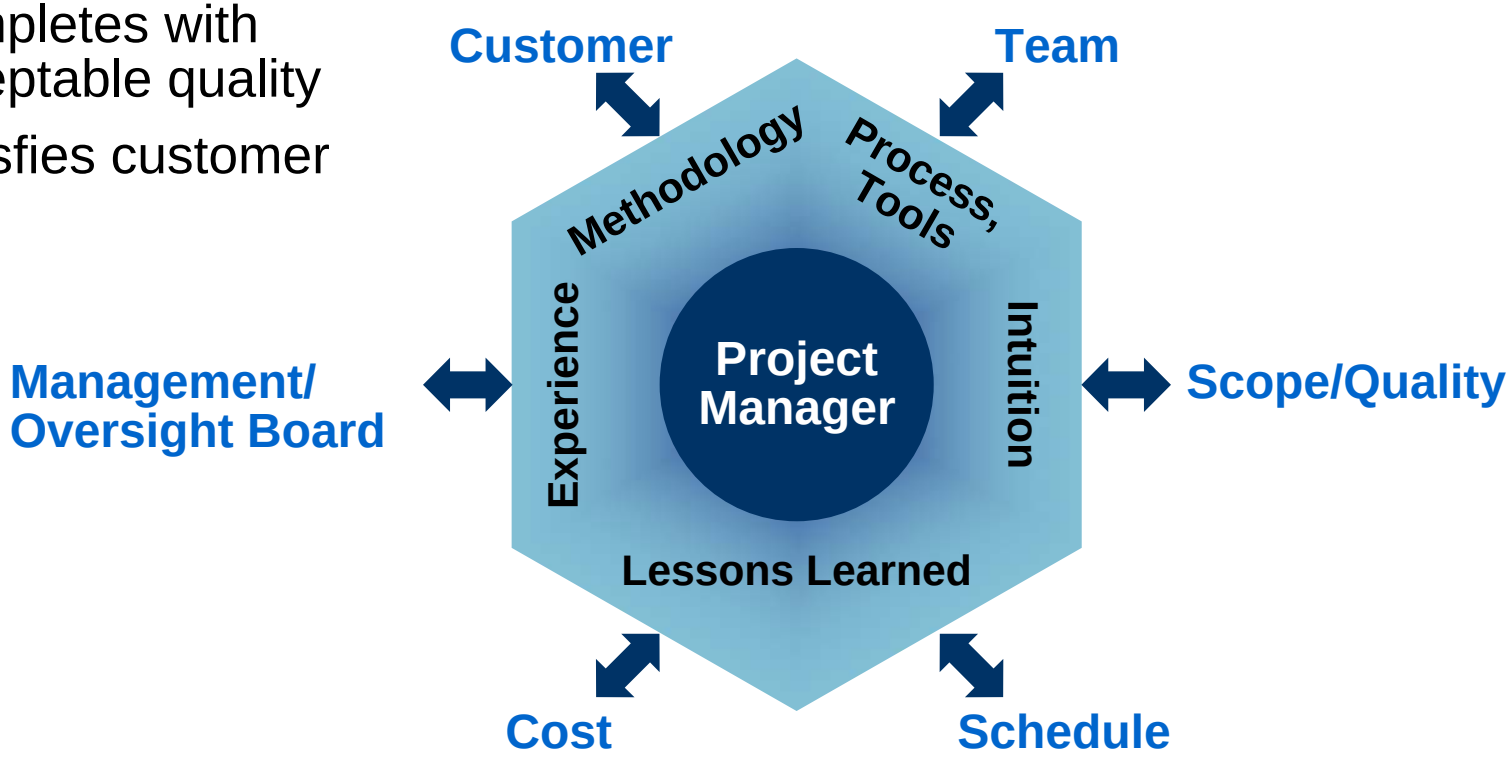
Definition of a Successful Project

- Completes on schedule
- Completes within budget
- Completes with acceptable quality
- Satisfies customer



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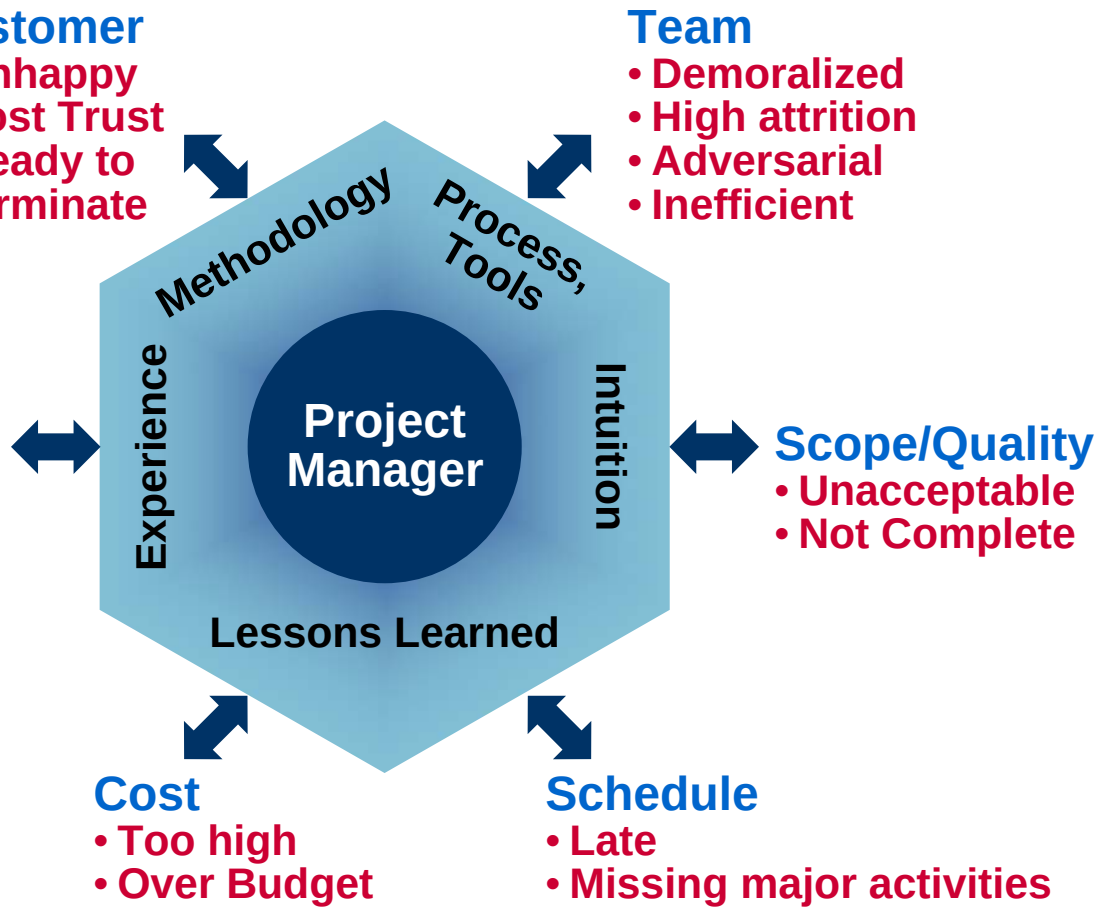
Signs of Trouble in Project

Combination of problems causing these signs, if not corrected quickly, can create snow-ball effect and lead to troubled project and ultimately failure



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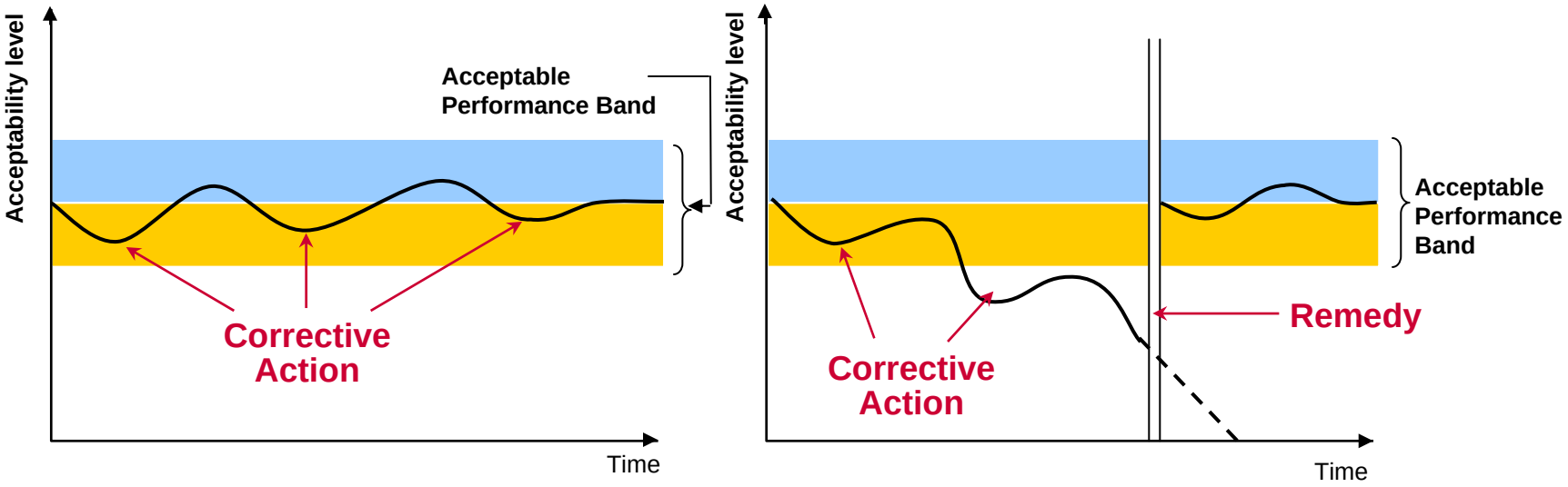
Comparative Notional History of a Successful and a Troubled Project



Successful Project
Executes corrective actions as needed to keep within acceptable performance band

Project in Trouble
Needs drastic remedial action to correct compounded problems and prevent it from total failure

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Elements of Project Management by Phase

Project Definition	Project Planning	Project Execution	Completion
• Scope • Approach • Top-level requirement • Contract/ subcontract • Risks • Assumptions/ constraints • Team • Interfaces	• Baseline schedule • Baseline budget • Baseline processes • Resources • Acceptance • Monitoring methods • Measurements	• Assign • Perform • Manage performance • Manage risks, issues • Prioritize • Measure progress • Monitor/review • Correct • Manage change • Communicate/report	• Manage delivery and acceptance • Manage transition • Prepare lessons learned • Reassign Project team • Close down physical environment
Define Destination	***Draw the Map***	***Deal with Dynamics, Make Decisions to Keep on Track***	***Arrive at Destination***

Experience ⟶ Awareness, Anticipation, Action

PM Process, Tools, Methodology, Experience, Intuition

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What Can Go Wrong? Pitfalls/Root Causes

- Project Definition
  - Scope and requirements not adequately defined
  - Team structure not workable
  - Risks and mitigation not adequately defined
  - Contract/subcontracts mechanisms not appropriate
- Planning
  - Not executable, unrealistic (resources, technology, budget)
  - Status cannot be determined on a regular time interval (weekly or at least monthly)
  - Not followed
    - Different organizations working to different schedules
    - Dependencies are not defined or violated
- Execution — Monitoring
  - Status of actual schedule and cost versus plan not determined regularly
  - Status not based on objective measures
  - Measures that are not indicative of real status of Project

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What Can Go Wrong? Pitfalls/Root Causes (Cont'd)

- Execution — Controlling
  - Responsibilities and authorities not clear or not respected
  - Status is not monitored and leads to confusion regarding actions needed
  - Actions not taken in a timely manner
  - Corrective actions are impeded by contract or other restrictions
  - Work being performed that is not on the plan and, therefore, not tracked
  - Change is not managed
- Reporting
  - Reports are not helpful for managing project
  - Reports are too high or too low level
  - Too many reports or reporting mechanisms
  - Too many entities to report to

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Case Study: High-Level Comparison of Projects C and L

Characteristics	Project C	Project L
Planned Duration	3 Years	3 Years
Actual Duration	5 Years	3 Years
Average Number of Team Members	200	150
Subcontracts	10	3
Team Structure	Segregated by function and organization	Integrated
Contract Type	Fixed Price	CPAF
Primary Subcontract	CPFF	CPAF
Client Organization	Large, not under single management structure — new	Small, managed under single structure

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Comparison of Overall Conditions of Projects C and L

Result	Project C Before Remedy	Project C After Remedy	Project L
Schedule			
Cost			
Client satisfaction			
Productivity			
Success in transition to operation			

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Signs of Success: Project L

- Large software development project for a state-of-the-art, mission-critical system development for NASA
- Project was performed within a large Program that was ISO 9000 and CMM Level 5 certified and had a 10-year history of excellence
- Project Manager and all Control Account Managers worked in a collaborative manner without regard to corporate affiliation
- Senior management attention and oversight was at the appropriate and helpful level
- Direction was clearly coming from the Project Manager (all actionable inputs from customer and users were provided to the team through the PM)

All releases and critical activities were developed and delivered on schedule (on a very tight schedule), with very high quality, and at 5% below the baseline budget.

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Success Enablers: Planning

- Project Plan well defined
- Schedule and budget baselines planned and controlled
- Scope and quality planned and controlled
- Measurement criteria established
- Project Management Plan (PMP) documented
- PMP approved by Senior Manager and Project Control Office (PCO)
- PMP kept < 1 year old
- Project team intimately familiar with plan

Project Management Plan

Project Overview

Background, client objectives, client responsibilities, SOW, Assumptions, constraints, acceptance criteria

Technical Approach

Services to be performed, technical considerations

Management Approach

Process, progress tracking, risk management, management reports and reviews, training, measurement, improvement

Project Performance Plan

WBS, schedule, resources, organization, interfaces

Required Disciplines

Subcontract management, software management, configuration management, quality management, systems engineering management, hardware management, operations management, security, logistics

Unresolved Issues

PMP ensured achievable objectives at start and adjust throughout the life of the project.

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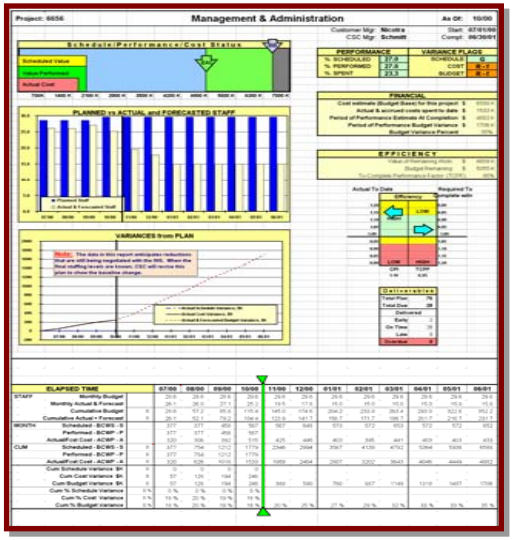
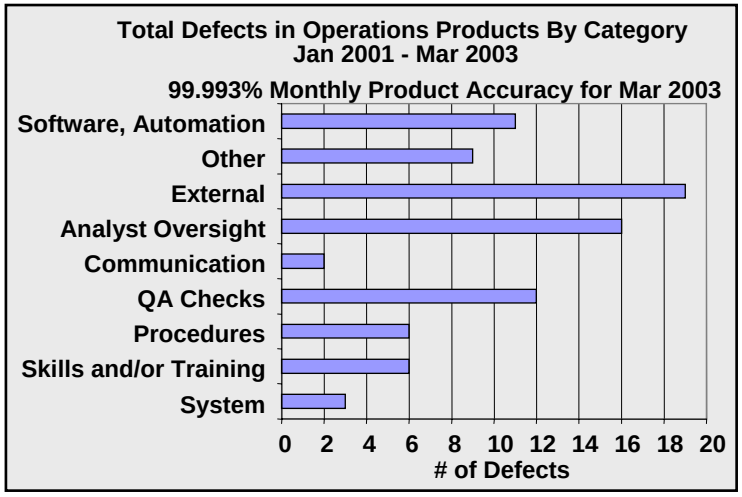
Success Enablers: Execution - Monitoring and Controlling

- Earned Value (EV) Measurement used for Monitoring and Controlling
- Baseline (cost/schedule) produced and controlled by PCO
- Monthly variance reports generated and distributed
- Baseline changes controlled
- Specific measures of quality and performance identified in PMP
- Monthly reports of measurement analysis were generated
- Corrective actions and improvements recorded and tracked





EV analyzed for early problem detection and timely adjustment to baseline. Measures are analyzed to ensure project meets performance objectives.

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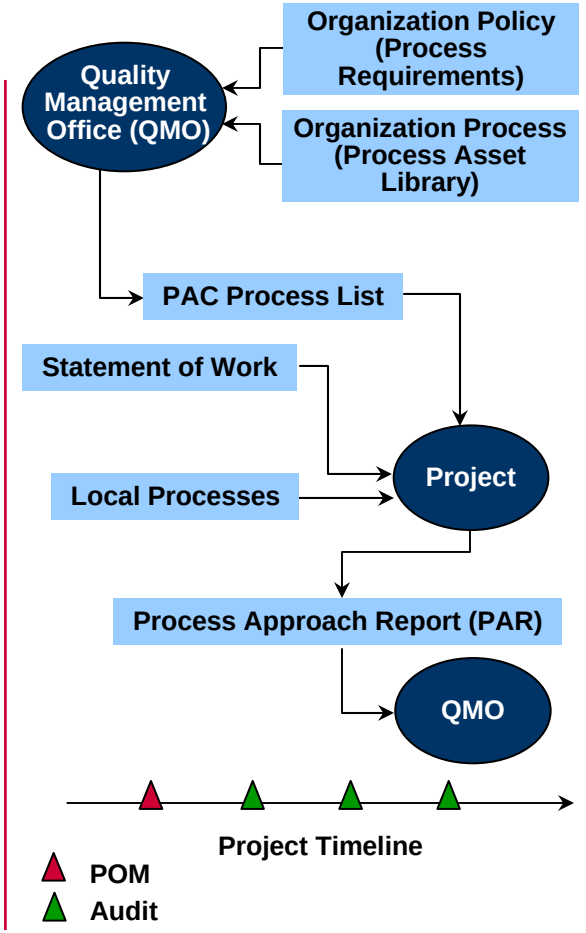
Success Enablers: Execution – Monitoring and Controlling Process Assurance

- Process Assurance Cycle (PAC) assisted with tailoring established processes for Project
- Process Orientation Meeting (POM) trained staff in process
- Audits ensured process use and reinforced the importance of process adherence
- Process Approach Report (PAR) was approved by Project Manager and QMO
- Project processes were documented
- Evidence existed that processes were being used
- Noncompliance was reported to senior management



Established agreed project processes and deployed to project team — PAC was essential in implementing key practices in projects.

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Success Enablers:
Reports and Reviews: Peer Reviews

- Peer reviews were established and used extensively
- Procedures for review were documented
  - Reviews of product during preparation
  - Final review prior to delivery
  - Review criteria
- Staff was trained
- Records of review were generated and kept for each product
- Every delivered product was reviewed by another team member
- All action items from reviews were closed

Intermediate Reviews

- Peer reviews
- Document reviews
- Technical reviews (design, etc.)
- Inspections
- Tests
- Customer reviews

Final Review

- Independent peer reviews
- Independent tests

Conducted intermediate and final product reviews to ensure high quality products.

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Success Enablers:
Reports and Reviews: Management Review

- Management reviews were conducted with
  - Senior Manager
  - Project Control Office (PCO)
  - Quality Management Office (QMO)
  - Project Manager
- Project participated in Red Flag Review if outside 10% cost/schedule/budget limit
- Project participated in Green Flag Review (review of overall project performance)
- Actions were documented and closed
- Project reports were generated for each review

Project Management Review Report

- Cost/schedule/budget variances
- Project goals and measures
- Improvement
- Corrective and preventive actions
- Risks and issues

Reviewed Project performance for early problem detection, immediate action, and reinforcement of requirements.

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Project L was delivered

- On schedule
- At 5% below budget
- Successfully supported launch and on-orbit operations

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Signs of Trouble: Project C (Before Remedy)

- Large software development project for a highly reliable database development
- First release completed development and completely failed system testing; returned to development team to correct lar number of problems
- Project Manager was replaced for the 3rd time
- Project was behind schedule and substantially over budget
- High degree of senior management attention and oversight
- Daily meetings generated actions for the day — no overall direction
- Work performed by developers, system engineers, testers, and management was not coordinated and caused rework
- No central control: Direction was coming from too many places, causing confusion among the Project Team
- Contract cost had reached ceiling, but subcontractor had no incentive to reduce cost or press to complete
- Scope was ill-defined – Disagreement on requirements
- Customer had lost trust

It was not clear whether Project was moving forward, backward, or spinning in place or if it would ever complete.

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Trouble Remedy for Project C

New experienced Project Manager was assigned and given full authority to “fix” Project — Actions taken identify areas of preventive measures

- Actions: Project Definition
  - Baselined requirements for the Release (customer, users, and all levels of test teams reviewed and approved)
  - Strengthened the Configuration Control Board
  - Renegotiated contract and major subcontract to align with Project scope and requirements

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Trouble Remedy for Project C (Cont'd)

- Actions: Planning
  - Led development of a realistic plan to complete the release with detailed, measurable (using earned value) work packages
  - Reviewed the detailed plan with responsible Control Account Managers and dependencies, and obtained agreement on dependencies
  - Presented plan to all senior managers both contractor and customers, and obtained approval
  - Trained all Control Account Managers in earned value and project status tracking and corrective action planning methods
  - Established clear goals; communicated goals and plan to all members of team and enforced the premise that, if it's not on the plan, it does not get worked on

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Trouble Remedy for Project C (Cont'd)

- Actions: Execution — Monitoring
  - Established schedule, cost, and variance metric reports
  - Conducted regular weekly task status reviews during which project control facilitated review by Control Account Managers of their control account status
  - Established threshold for control account variances at which Control Account Managers had to develop rigorous corrective action plans
- Actions: Execution — Controlling
  - Enforced rigorous corrective action planning for all Control Accounts with Variances exceeding threshold
  - Tracked status of corrective actions plans to completion
  - Managed Plan changes through rigorous process of task plan change request that were reviewed by at least two levels of senior management
  - Exercised rigorous scope control: Project Manager in full control of content of the software as chair of the Configuration Control Board

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Trouble Remedy for Project C (Cont'd)

- Actions: Reporting
  - A single weekly report based on reviewed and approved Project status
  - A single weekly status for all senior managers of customer and contractor organizations
- Actions: Rebuilding the Project Team
  - Modified subcontracts to better align with prime contract – established integrated product teams
  - Removed several levels of subcontract tiers
  - Streamlined organization, removed additional and non value-added layers of management, functions, meetings
  - Established clear lines of authority, responsibility, and communications

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Project C was delivered

- Three months ahead of the re-planned schedule
- Within re-planned budget
- Met all operational acceptance criteria

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Summary Comparison of Success Factors

Success Factor	Project C Before Remedy	Project C After Remedy	Project L
Stability of management team	3 Managers	1 Manager	1 Manager
Experience of PM: Training	PMI Certified	PMTP/PMOS/ PMI Certified	PMTP/PMOS/ PMI Certified
Experience of PM	Limited	Highly experienced with projects of similar complexity	24 years experience in application domain and client
Use of Project planning/statusing	Sporadic	Rigorous	Rigorous
Change management	No	Yes	Yes
Independent QA	Not effective	Yes	Yes
Use of EV	Not effective	Yes	Yes
Active Change Control	Sporadic	Yes	Yes
Certifications	CMM L3	CMM L3	ISO, CMM L5
Management infrastructure in place at start of Project	No, Not used properly	Yes – at remedy point	Yes
Technology infusion	Not controlled	Managed	Managed
Scope/requirements control	Poor	Yes	Yes

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Areas of Preventive Action for Project C

Project Definition	Project Planning	Project Execution	Completion
• **Scope: Better defined and agreed to** • **Approach: Plan for technology management** • **Top-level requirement: defined** • **Contract/Subcontract: Reduce numbers, process, contractual arrangement** • Risks • Assumptions/constraints • **Team: Integrated** • **Interfaces: Open with control and clear authority and responsibility**	• **Baseline Schedule – trackable** • **Baseline Budget – trackable** • **Baseline Processes** • **Resources** • **Acceptance: Defined** • **Monitoring Methods** • **Measurements** – **More useful and timely**	• **Assign: Define clear direction, defined lines of authority** • **Perform** • **Manage performance** • **Manage risks, issues** • **Prioritize** • **Measure progress** • **Monitor/review** • **Correct: Do not wait until problems are overwhelming** • **Manage change: Establish process and control change** • **Communicate/report**	• **Manage delivery and acceptance** – **Coordinate better with receiving organizations/ users** • **Manage transition** • Prepare Lessons Learned • Reassign Project Team • Close Down Physical Environment
Define Destination	***Draw the Map***	***Deal with Dynamics, Make Decisions to Keep on Track***	***Arrive at Destination***

Experience → Awareness, Anticipation, Action

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Can Troubled Projects Be Prevented? YES!

If you …

- Use established project management methods and wisdom to plan, monitor, and control
- Pay attention to the early signs of problems and take action
- Experience always helps — if experienced PM, then trust intuition; if relatively inexperienced PM, use a mentor
- After all project management is what makes rocket science work — it's complex and should be treated as such